INSTRUCTIONS

FOR

BOILER SURVEYORS

THE VULCAN BOILER & GENERAL INSURANCE CO. LTD.

Head Office : 67 KING STREET, MANCHESTER, 2

Telephone : BLAckfriars 6611 Telegrams : "BOILER," Manchester

Established 1859

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INTRODUCTION

These notes are not intended to show in detail what a Surveyor should do on all occasions in the performance of his duties, but they are intended to show the general principles which should govern his work, together with some instructions on certain phases.

Owing to the numerous types of Pressure Vessels which we are called upon to examine and certify it must be realised that it is not possible for any one Surveyor to have experience of all of such, and there can be no system of training which would embrace the whole field of a Surveyor's duties. New experiences may, therefore, be expected throughout a Surveyor's life, but this, of course, makes the duties always interesting. The wide range of experiences which may be met emphasises that knowledge on Engineering matters is never complete, and constant vigilance must be maintained.

October, 1954.

Instructions for Boiler Surveyors

ACTS OF PARLIAMENT RELATING TO PRESSURE PLANT

The examination and certification of steam boilers, superheaters, economisers, steam receivers and air receivers in Factories in this country is governed by the **Factories Act, 1937,** which requires examinations to be made periodically and a certificate supplied.

The examination and certification of steam boilers in or about a Mine is governed by the **Coal Mines Act, 1911.** There are sections of this Act which apply to **Metalliferous Mines** and to **Quarries,** and these sections embrace the examination and certification of steam boilers, superheaters, economisers and air receivers. The Act requires an examination to be made periodically and a certificate supplied in each case.

The requirements of these Acts relating to our work should be mastered. You are supplied with a copy of the Factories Act, 1937, or with a pamphlet showing all relevant parts.

As regards the Mines Act, the relevant parts will be found on the back of the Prescribed Report Forms 39, 109, 110, 111 and 112.

The Boiler Explosions Act, 1882, is "An Act to make better provision for inquiries with regard to boiler explosions."

Under this Act a boiler is defined as follows:—

> "Boiler means any closed vessel used for generating steam, or for heating water, or for heating other liquids, or into which steam is admitted for heating, steaming, boiling or other similar purposes."

It will be seen that this Act embraces such vessels as water heating boilers. The Act does not enforce periodical examinations but provides for inquiries into explosions of any of the types mentioned. This means that although Users of water heating vessels are not obliged to have such vessels periodically examined it is in their interests to do so, as in the unfortunate event of an accident, at the subsequent inquiry by the Ministry of Transport Commissioners, they would be in a position to show that they had taken all reasonable precautions to prevent an accident.

It is under this Act that Inquiries into boiler explosions of all types are held by the Commissioners appointed by the Ministry of Transport.

REPORT FORMS

The following is a list of report forms prescribed by the State Secretaries.

Factories Act, 1937

Form 55.	For reporting the thorough examination of Steam Boilers.
Form 55a.	For reporting the examination under pressure of a Steam Boiler, Superheater or Economiser, that is, a supplementary report.
Form 56.	For reporting the thorough examination of an Economiser.
Form 57.	For reporting the thorough examination of a Superheater.
Form 58.	For reporting the thorough examination of a Steam Receiver.
Form 59.	For reporting the thorough examination of an Air Receiver.
Form 60.	For reporting on Steam Receivers or Air Receivers under normal pressure, that is, a supplementary report.
Form 62.	For reporting the thorough examination of a Steam Tube Oven or Steam Tube Hotplate.

Coal Mines Act, 1911
(Coal Mines)

Form 39.	For reporting the thorough examination of Steam Boilers.
Form 39a.	For reporting the examination under pressure of a Steam Boiler, that is, a supplementary report.

(Metalliferous Mines and Quarries)

Form 109.	For reporting the thorough examination of an Air Receiver.
Form 109a.	For reporting the examination under pressure of an Air Receiver, that is, a supplementary report.
Form 110.	For reporting the thorough examination of Steam Boilers.
Form 110a.	For reporting the examination under pressure of a Steam Boiler, Superheater or Economiser, that is, a supplementary report.
Form 111.	For reporting the thorough examination of an Economiser.
Form 112.	For reporting the thorough examination of a Superheater.

The Company's Report Forms

In addition to the "Prescribed" report forms there are others of our own for use on certain occasions, and the Surveyor should be familiar with all of them and the occasions when they should be used.

The forms and occasions are briefly as follows:—

B.12 Form. For reporting an external examination. either working or standing out of use, of an Economiser where "Prescribed" forms 55a or 110a are not applicable.

B.17 Form. For reporting the thorough examination of an Economiser where "Prescribed" report forms 56 or 111 are not applicable.

B.17a Form. This should accompany all thorough and partial reports of Economisers. It is a form for giving additional details of the nature and extent of the examination made, to aid the consideration of the official report at Head Office.

B.55 Form. This should be forwarded for all Steam Boilers at the first examination and afterwards as instructed from Head Office. Any alterations of working conditions should be reported as they occur in order that this form may be amended and kept up to date, or a new form supplied.

B.94 Form. This should accompany all thorough and partial examination reports of Steam Boilers. It is a form for giving additional details of the nature and extent of the examination made, to aid those giving consideration to the official report at Head Office.

B.96 Form. For reporting thorough or partial examinations of Steam Boilers not subject to the Factories Act or Coal Mines Act. It can also be used for reporting some partial examinations of Steam Boilers which are subject to the Factories Act or Coal Mines Act.

B.97 Form. For reporting the examination of Vessels other than Steam Boilers which are not subject to the Factories Act or Coal Mines Act, and of such items as water heating boilers.

B.98 Form. For reporting examinations of Boilers and any other type of Vessel, whether under working conditions or standing out of use, when a "Prescribed" form is not required or cannot be issued for any reason.

B.132 Form. For reporting the examination of Second-hand Boilers and other pressure vessels and should be supplied when directed.

B.133 Form For supplying to Head Office additional and confidential details of Second-hand Boilers or Vessels examined and should always accompany the B.132 Form.

B.168 Form. Boiler and Vessel Accident Report Form.
For supplying full information of accidents and the damage caused. There are printed "Points" for the Surveyor's guidance at the foot of the form and these should be well noted.

DIMENSION SHEETS

B.61 Sheet. For showing the details of construction of Steam Boilers.

B.61a Sheet. For showing the details of construction of Heating and Domestic type Boilers.

B.61b Sheet. For showing the construction of Pressure Vessels other than Steam Boilers.

The queries and instructions on the sheets will be found a good guide as to what information is required in each case.

Great care should be exercised in obtaining the dimensions and the information, as on the details given calculations are made at Head Office of the stresses involved on which the safe working pressure of the item is assessed.

Where applicable we follow the Ministry of Transport, British Standard or Allied Offices Technical Committee rules for the safe working pressures of structures. There are, however, numerous Vessels and parts thereof where no published rules apply, and in such cases we use our own or deal with the case from first principles combined with our experience.

FIRST EXAMINATION

At the first visit to a Boiler or other Pressure Vessel, if the item is in use or standing unprepared for thorough examination, the best examination possible should be made and whatever details of construction are available should be taken. Information as to when and by whom the item was last thoroughly examined, and the condition in which it was found, should be obtained and a copy of this report sent to Head Office. Arrangements should be made for a thorough examination unless the firm have a certificate that we could accept.

THOROUGH EXAMINATIONS

A Surveyor when visiting firms should endeavour to arrange for thorough examinations as they fall due, and advise Head Office of the result of his endeavours.

When an examination is made by instruction from Head Office the instruction memo. should be returned with the report of the examination.

NUMBER OF EXAMINATIONS TO BE MADE

For all items under insurance or inspection contract we should aim at carrying out three inspections per year, one thorough followed by two working, or three working inspections as the case may be. The first working inspection of a steam boiler should be made as soon as practicable after the thorough examination.

In particular under no circumstances must the examinations of plant under inspection contract without insurance fall into arrears, for in such cases the fee paid by the client is for the inspection service only.

WEEKLY RECORD SHEET AND EXPENSE SHEET

The weekly statement of visits, examinations, reports and expenses, Form B.10. is specially required at Head Office on the Monday morning following the week with which the sheet is concerned and should therefore be forwarded regularly in accordance. There should be no reason to justify delay in sending the sheet, the work to be recorded is well known to the Surveyor, and the filling in of the form should take only a few minutes. A habit should be formed of entering on the sheet each day's work as completed.

If for any reason some reports for the week's work have not been posted the record sheet must not be held back in order that the Column "Date report posted" may be filled in, but the reason for not posting should be stated on the sheet.

It should be kept in mind that when a Surveyor delays sending this sheet at the proper time our Head Office organization is upset, and its efficiency lowered in consequence.

DISTRICT ARRANGEMENTS

On days when no appointments are booked a Surveyor is expected to carry out working inspections which may be due, and to give attention to any outstanding matters. There may be days when appointments only partly fill the day, and in such cases working inspections should be made to complete the day's work.

It is expected that a Surveyor will arrange his work in a manner that will produce the best results for efficiency and economy. The costs of carrying out the work of the district are largely under the control of the Surveyor, and visits should be planned and co-ordinated to the best advantage economically.

It will be understood that our organization at Head Office has to be efficiently planned for the Company's business to meet the keen competition which exists, and a Surveyor is expected to co-operate in every way possible. Promptitude in forwarding reports, dimension sheets and other forms; in dealing with correspondence, and the faithful carrying out of instructions, are a few ways by which this efficiency is maintained.

ADDITIONAL AND REPLACEMENT BOILERS AND OTHER VESSELS

When a Surveyor finds an item not yet insured he should, with the firm's consent, make an examination and take particulars with a view to its certification and insurance.

ENQUIRIES TO BE MADE

At every visit for examinations, enquiries should be made of the attendant and officials as to whether any defects in the vessel or fittings have been observed at any time, also whether any alterations have been carried out or not. All unusual features should be reported.

POSTING OF REPORTS

All examinations should be reported to Head Office on the day on which they are made, if at all possible.

INTERESTS OUTSIDE THE COMPANY'S BUSINESS

The Company has no interests directly or indirectly in the supply or sale of Engines or Machinery, Boilers or other Vessels, de-scaling fluid or boiler compounds for the prevention of softening of scale, and Surveyors are not allowed to have any such interests.

VISITS SHOULD BE OFFICIALLY ANNOUNCED AND THE RESULT

The Surveyor on making his visit should call at the Client's Office before entering the works and announce his visit.

Serious defects which require immediate attention must be pointed out to the principal, manager, engineer or other responsible official before leaving.

ALTERATIONS AND REPAIRS

Any alteration, either structural or in the method of working a boiler or other vessel, should at once be reported. Repairs which weaken a vessel, such as the introduction of thinner plates or a weaker form of seam or change in the stays should be immediately reported for consideration.

VERBAL RECOMMENDATIONS OF SURVEYORS

Any recommendation with regard to repairs or the general working of the plant, which the Surveyor may feel called upon to make to the officials of clients at the time of his visit, should be repeated in a report to Head Office.

SURVEYOR'S SIGNATURE

Apart from reports to Head Office a Surveyor should not sign any document or certificate as representing the Company unless specially authorised to do so from Head Office.

THE REPORTING OF CORROSION, WASTING AND GROOVING

In reporting on corrosion or wasting it should be clearly stated how far it affects the seams, especially the longitudinal seams. As the strength of a riveted plate in good condition depends on the strength of the material left between the rivet holes of the seams, chiefly the longitudinal seams, the importance of any corrosion or wasting should be considered in relation to these parts.

Corrosion and wasting require depth, area and position to be reported, also whether general or isolated or widely detached.

Grooving requires depth, length and position to be stated.

A sketch should be given whenever the defects can be made clearer by so doing, a "picture" will so often tell the story better than words.

REMOVAL OF BRICKWORK AND OF COVERING OR LAGGING

Where any dampness of brickwork or any other material in contact with a boiler is observed and the Surveyor may have reason to suspect hidden defects, it will be necessary to have the brickwork or lagging removed before the boiler is again worked in order to ascertain the actual condition of the hidden plates.

Special care should be exercised where the general conditions are not good, as in the case of boilers being set in the open and exposed to the weather or set below the ground level.

The Home Office requirements regarding the Removal of Brickwork will be found under "NOTES" on the back of the prescribed report Form 55.

In the case of boilers such as locotype, vertical, etc., which are covered with lagging this should, as a general rule, be removed periodically, say every ten years, unless there are suspicious circumstances when, of course, immediate removal would be required.

DECEPTIVE APPEARANCE OF SURFACE CORROSION OR WASTING, AND TESTING BY DRILLING

In some cases wasting or corrosive action, either internally or externally, leaves a smooth even surface which gives no indication of wastage and is therefore deceptive. Where there is any doubt as to the remaining thickness of a plate, test holes should be drilled which can afterwards be plugged with rivets or with slightly tapered screwed plugs, preferably put in from the pressure side.

Drill testing should be resorted to whenever there is doubt as to the thickness of plate, the result is then a fact and not a matter of opinion.

DEFECTS AND ALTERATIONS

After defects have once been reported or alterations advised they should be referred to in all subsequent reports until the matter has been given satisfactory attention.

WORKING EXAMINATIONS

At every examination under working conditions the boiler or other item should be examined externally so far as possible, together with an examination of all mountings or steam control fittings. A Surveyor should ascertain by actual test whether the mountings or fittings are in good working order or not. Special attention should be paid to the loading and efficiency of safety valves and reducing valves, the efficiency of water gauges, low water alarms, pressure gauges and blow down valves.

ECONOMISERS

In regard to the examination of the ordinary cast iron vertical tube type of economiser, attention is called to the following points.

The ends of the waste pipes, of safety valves and blow off valves, should be open to view in order that any leakage may be at once detected.

To preserve the external parts of an economiser the temperature of the water entering it should not be less than 100 degrees F., and if steam jets are used at the furnaces the temperature should be higher. When the temperature of the entering water is lower than this, moisture of condensation from the flue gases settles on the pipes, causing corrosion at and near the bottom ends.

Only when water is being pumped through an economiser should the hot gases enter the economiser chamber. At all other times the hot gases should be diverted through the bye-pass to the chimney to avoid generating steam in the economiser with its attendant risks of water hammer action and explosion.

The outlet temperature of the water should not be allowed to reach that of the steam in the boiler by at least 30 degrees F., to prevent generation of steam in the economiser pipes and boxes.

Every economiser should have a non-return valve on the inlet feed pipe. Where more than one economiser or several groups of a large economiser are fed by separate inlet pipes from one main feed pipe it is necessary for safety that every inlet pipe should be fitted with a separate non-return valve.

Graphitic wasting, or to give it its scientific term, graphitic disintegration, is a dangerous form of internal defect, and Surveyors should be vigilant in detecting this. It is where a proportion of the iron is changed into a black oxide which looks like Plumbago. This form of corrosion leaves the pipe apparently the full thickness, but on applying a knife or chisel the graphitic part is easily pared

away. This kind of corrosion is usually found in economisers which are fed with soft waters, rarely, if at all, where the feed water is hard. Hard water may, however, contain corrosive elements which could cause other forms of corrosion.

The graphitic wasting may be detected at the top edges of the pipes and on the under side of the top caps. When wasting is found at these parts to any extent it will be necessary to have a number of pipes removed and broken up in order to ascertain to what extent the wasting is affecting the pipes generally. Provision is made for this test by the Authorities, as you will see by Note "A" on the back of the prescribed report Form 56.

Where a Circulator is fitted a lightly balanced swing check valve should be fixed between it and the hot water supply pipe from the top of the economiser, this would prevent connection between the hot end and the cold feed supply under certain dangerous conditions.

PRESSURE GAUGES

The testing of a pressure gauge is an essential part of a Surveyor's duty at the examination of a boiler, steam receiver or air receiver.

The Factories Act, 1937, requires a correct pressure gauge to be fitted in each case, and as we are employed by the Owner of the vessel as the competent authority for certification we must know whether the law in this respect is fulfilled or not, and we cannot know unless a test is made. For the purpose you are supplied with the "Vulcan" Pressure Gauge Tester. The result of the test must be recorded on the report of the item concerned.

A gauge should be tested to at least 25 per cent. beyond the maximum working pressure.

In recording the result the following terms should be used under the conditions named.

The word "Fast" should be used to denote that a gauge shows more than the correct pressure.

The word "Slow" should be used to denote that the gauge shows less than the correct pressure.

A gauge may be reported "In order" when 2 lbs. "slow" or 4 lbs. "fast" within a reasonable limit on either side of the working pressure. Any error, not being excessive at any other part of the range, except "slow" at zero, may be disregarded.

Of course if a gauge is found correct then the word "correct" may be used.

In reporting upon an error an allowance of 1 lb. should be made to cover errors of observation. For instance, if a gauge shows 7 lbs. "fast" call it 6 lbs., for 5 lbs. "slow" call it 4 lbs.

In cases where one pressure gauge may serve for several vessels, such as at the steam control fittings for a number of steam receivers, the test of the gauge should be referred to on the thorough examination report of each vessel in the group. If the thorough examinations are not all made at the same time then on all the reports except the first the date of the pressure gauge test should be entered. Therefore, on all thorough examination reports reference to the pressure gauge test should appear.

The test is not limited to the thorough examination as at any other time a test may be considered necessary such should be carried out.

The general practice should be to test a pressure gauge at least once a year.

The pressure on a water main is sometimes required, and this may be obtained by holding the "Vulcan" Gauge Tester under a water tap with a rubber ring between.

STEAM RECEIVERS AS DEFINED BY FACTORIES ACT, 1937

When such vessels are not so constructed as to withstand with safety the pressure of the boiler to which they are connected, or the maximum pressure from any source of supply, the Surveyor should see that the steam control fittings comply with the requirements of the Factories Act.

In all such cases a line sketch of the steam supply piping should be given on the dimension sheet, showing the diameters of the pipes, positions and diameters of all valves and the pressures from the source to the vessel. Expressions like "Boiler Pressure" on these sketches should be avoided, as those scrutinising the details may have no information as to this pressure. State the actual pressures at the various points and make the sketch self-contained.

In connection with pressure control fittings it will be noted that the Factories Act, Section 30, Paragraph (1) (a and b) allows an automatic appliance as an alternative to a reducing valve or a safety valve. The "Vulcan" patent "Isolator Safety Valve" is recognised as such an appliance and fully meets the requirements of the Act for both the reducing valve and the safety valve. See the Company's literature on this valve.

WATER PRESSURE TESTS

While a hydrostatic test is a valuable one the limitations of its value should always be kept in mind. A satisfactorily sustained hydrostatic test at best can only be regarded as negative evidence of fitness, but by no means conclusive proof of it. Such a test should never be regarded as sufficient and satisfactory in itself, but as supplementing the most careful examination the vessel may permit.

The important point to keep in mind in connection with a hydrostatic test is the measurement of the strain produced. At all parts where movement, extension or deformation would be expected, such as at flat areas, careful measurements must be made of deflections and the results recorded, showing also whether permanent set occurs or not.

It should be understood that the stresses at parts of some structures are sometimes only approximately determinate by calculations and in such cases the deflections obtained under hydrostatic test are of special value in the assessment of the safe working pressure.

The following shows our general practice as to test pressures.

> For a working pressure up to 100 lbs. per sq. in. test to twice the permissible working pressure.
>
> For permissible working pressures from 100 lbs. per sq. in. to 200 lbs. per sq. in., test to working pressure plus 100.
>
> For a permissible working pressure of 200 lbs. per sq. in. and upward, test to $1\frac{1}{2}$ times the permissible working pressure.

In the special case of high pressure bottles the test pressure should be twice the permissible working pressure.

There are times and cases where, owing to special circumstances, we may deviate from this practice. We are prepared at all times to give consideration to such cases.

PRESSURE ACCUMULATION TESTS

On occasions it may be necessary to test boiler safety valves to see if they are of sufficient area for release of excess pressure which could be generated. On such occasions it must be understood that the test should be made under conditions of maximum evaporation, that is, with full fires, feed water shut off, and all outlets closed, with the safety valves free to function.

In the case of a test of Air Receiver safety valves, all outlets should be closed and the compressor worked at full capacity, with the safety valve free to function.

VESSELS USED FOR SPECIAL PROCESSES

When a vessel is used for some special process where chemical changes take place the dimension sheet should contain a short description of the process, the names of the substances used, and the expected reactions.

IDENTIFICATION MARKS

It is important that search should be made on every item for maker's numbers, stamped details, or any other identification mark or particulars, and when found they should be reproduced on the dimension sheet of the item.

EXAMINATION OF SECOND-HAND BOILERS FOR PURCHASE

In numerous cases clients purchase second-hand boilers or other vessels subject to a satisfactory report of examination. It will therefore be recognised that the responsibility for the purchase, which may involve a large sum of money, lies chiefly with the Examiner. To avoid disputes it is essential that the prospective Purchasers should be under no misapprehension as to the limitation of the examination, such as deposit on the plates, inaccessibility in nests of tubes, narrow water spaces, etc., and such matters should be clearly stated on the report. The boiler or vessel should be completely stripped so that the condition of all accessible parts may be placed on record, and careful examination and reports should be made of previous repairs.

With multitubular boilers consideration should be given to the advisability of withdrawing some tubes for examination.

It should be kept in mind that the examination is not just to see if the boiler or vessel may be certified for the usual period of service, but to see if the purchase of the item can be justified for several years' service.

The examination should be a keen one in order that the report may be made with confidence.

OIL IGNITION IN AIR RECEIVERS

From time to time explosions of air receivers occur, due to oil vapour ignition. The presence of oil vapour arises from the lubricating oil used in the compressor cylinder, particles of which are mixed with the compressed air. Should the temperature of the compressed air reach the flash point of the oil then the oil-laden air is an explosive mixture, similar to that in an internal combustion engine cylinder, and a spark only is necessary to cause an explosion. The force of the explosion will, of course, depend on the proportions of the mixture. A spark may be caused by friction in the compressor, by dust particles in the air or pieces of carbon glowing, due to the high temperature of compression in the cylinder.

Among other things a leaky delivery valve is often the cause of a high temperature. Such a valve allows part of the hot air of compression to leak back, and thus increase the temperature of the incoming charge before compression.

It is therefore essential for safe working that the air temperature should be kept below the flash point of the lubricating oil.

The flash point of the lubricating oil advised by the British Standard Institution for air compressors is 382 degrees F. A fusible plug fitted in the air delivery pipe is advised as a safety valve. Such a plug as that made by the "Vulcan" has a melting point of 362 degrees F. which by melting before the danger point is reached gives due warning that a dangerous temperature has been approached. (See the Company's literature on fusible plugs.)

The Home Office recognise this particular danger, and in their publications advise that a fusible plug should be fitted to prevent an oil vapour ignition explosion unless for any special reason you are otherwise instructed all first reports should advise the fitting of a fusible plug.

TIME AND CONSEQUENTIAL LOSS INSURANCES

Some of our clients extend our standard policy of insurance against explosion and collapse to include payment for loss of output or profit when the insured boiler or other vessel has been put out of action. In such cases it will be recognised that examinations and repairs must be made with additional promptitude, otherwise we may be involved in a large expenditure for each day the plant is out of action.

The extension for such contingencies operates only when the standard material damage policy comes into operation and your second notices will be marked to show such cases.

LIABILITY

It must be kept in mind that the question of liability for an accident to any item is decided at Head Office.

SILENT RISKS

In such cases we undertake to make periodical examinations and to furnish reports with a view to keeping boilers in order and ready for working whenever they may be required. As the examinations are the sole object of the client retaining the items under our supervision and for which they pay a premium, it is important that the examinations should not be allowed to get in arrears, otherwise we are not in a position to justify our part of the contract.

LABORATORIES

The Company has its own chemical and metallurgical laboratories, each staffed with experts for dealing with problems which arise in connection with its business. For moderate fees the analysis and testing of metals, fuels, feed waters, oils, etc., are undertaken, and investigations made of chemical and metallurgical problems.

RECORDS

A Surveyor has records to keep of various matters, and he is left to choose his own methods. A lack of a clear system may easily cause confusion and a lot of unnecessary labour, therefore it is essential that suitable methods should be adopted for the keeping of all records.

The recording of engagements is a simple instance. As instructions are received these should be carefully recorded and the list regularly scanned in the Diaries supplied in order that all engagements may be faithfully kept. Whatever method is adopted the keeping of a pocket diary with engagements duly entered is an advantage, as this can be carried about while on duty and referred to whenever an additional engagement requires to be made.

EFFICIENCY

A Surveyor can save himself a lot of time and trouble by being methodical in his work. Have a method of tackling examinations. Give thought to every type of item examined as to the most efficient way of making the examination.

The examination of a Lancashire type boiler is a good example of how time may be wasted and unnecessary work carried out by overlapping and having to retrace one's steps more than is necessary unless the route is planned. Settle where best to start, which way to go, and where to finish to the best advantage, and keep to your plan on all occasions.

This doing of the same thing each time will also be of advantage when making the report on the examination as it will be found easier to visualise what was seen if the direction and general plan of the examination is fixed.

CORRESPONDENCE WITH HEAD OFFICE

When dealing with letters received from Head Office seeking information on any matter, a Surveyor is expected to be helpful in his replies. It is so often easier to give a "yes" or "no" to a query whereas some explanatory note or fuller information would help so much more to an understanding of the subject. At all times seek to deal with the spirit rather than the letter of the communication.

RULES AND REGULATIONS

It must be kept in view that our work calls for judgment and decision, based on experience and knowledge of engineering principles and not on hard and fast rules to suit all occasions. When rules can be so framed then the judgment of an Engineer will not be required.

J. EYERS, B.Sc., M.I.Mech.E.,
Chief Boiler Engineer.

GEOFFREY F. BULLOCK, M.A.(Cantab.),
General Manager.